renewable sources of electricity that would be commercially feasible in the United States and that would reduce fossil fuel dependence and air pollutant emissions. The Proposed Action would address this need by partially funding the construction of an intermediate-scale switchgrass processing and storage facility and related activities to test the viability of a promising biomass energy crop.

Alliant Energy. Before Alliant Energy would proceed with plans and investments for commercial switchgrass operations, it needs to demonstrate that full-scale operations can be achieved, sustained, and verified in a manner that allows it to remain in compliance with all existing permitted emission levels. Alliant Energy further needs to ensure that (1) sustained co-fire operations are technically feasible, (2) such operations would not result in any degradation of the plant's boiler or operating parameters, and (3) OGS fly ash would continue to be marketable. The Proposed Action would also support Alliant Energy's need to confirm whether switchgrass co-fire operations would qualify it for credits under a recently enacted Iowa law (Iowa Code Section 476.41 et seq. (2001) [House File 577]) that requires all electric utilities operating in the state, including those not regulated by the Iowa Utilities Board (IUB), to offer green power options to their customers, beginning January 1, 2004.

Chariton Valley Resource Conservation and Development Inc. The Proposed Action responds to Chariton Valley RC&D's need to further assess the adequacy of the existing regional infrastructure to sustain switchgrass harvesting, transportation, storage, and sales, and to assess further the overall economic and agricultural viability of switchgrass as an energy crop. Information gained through these further assessments would be used as a basis for gauging the technical and environmental feasibility, costs, and benefits of using switchgrass as a fuel to replace a portion of the coal burned at OGS. Upon approval of the Proposed Action, DOE would provide a portion of the necessary funding to the Chariton Valley RC&D, which in turn would secure the balance of the necessary funding and subsequently coordinate with Alliant Energy and engineering firms to implement the Proposed Action.

1.5 Organization of the EA

This EA is structured in accordance with the standards set forth in DOE's NEPA implementing regulations and guidelines. Section 2.0 describes the Proposed Action and the No Action Alternative in sufficient detail to give the reader an understanding of the actions that would take place during construction, operation, and decommissioning of the proposed switchgrass co-fire test facilities, and the ramifications if they did not take place. Section 3.0 characterizes the existing environment at the proposed site and the area where the switchgrass feedstock would be obtained from various environmental perspectives: air quality and meteorology; soils and geology; biological, water, and cultural resources; land use; noise; infrastructure; aesthetics, socioeconomics, and environmental justice. Section 4.0 assesses the impacts that would or could occur if the Proposed Action were implemented. Section 5.0 describes the cumulative impacts that could occur from the Proposed Action when combined with other related activities. Section 6.0 addresses short-term uses of the environment and the effect on long-term productivity, and the irreversible and irretrievable commitment of resources should the Proposed Action be implemented. Section 7.0 lists the documents, websites, and other sources of information cited in this EA. Appendix A contains the text of DOE's scoping letters, Appendix B contains the responses DOE received, and Appendix C contains the scoping letter distribution list. Appendix D contains a summary and a full copy of the one comment letter DOE received regarding the Draft EA and DOE's responses to the items raised in the letter.

2.0 PROPOSED ACTION AND NO ACTION ALTERNATIVE

DOE is considering providing partial funding for (1) the design and construction of a switchgrass storage, handling, and conveying system into the boiler at the OGS, (2) operational testing of switchgrass as a biomass co-fire feedstock at OGS, and (3) ancillary activities related to growing, harvesting, storing, and

transporting switchgrass in areas of the Rathbun Lake watershed. This section describes both general and site-specific activities that would occur if the Proposed Action were authorized. It also characterizes the No Action Alternative, as required under NEPA. No other action alternatives are analyzed because (1) no generating plants other than OGS have the installed infrastructure and operating experience necessary to conduct Phase 2 co-fire testing, and (2) the Rathbun Lake watershed is the only viable source of the supply of switchgrass necessary to conduct the testing.

2.1 Proposed Action

2.1.1 New Facilities

Design Basis. During the last 12 years, the Danish power company Elsam has implemented a comprehensive program to develop clean coal and biomass technologies in order to comply with Danish government-mandated carbon dioxide abatement goals and biomass applications. One option considered and advanced was co-firing straw at existing pulverized coal plants. In order to assess the prospects of this technology, a 150-MW coal-fired plant, the Studstrup Power Station, was converted and retrofitted to co-fire straw. From January 1996 to February 1998, Elsam conducted a 2-year demonstration program. The design and operational experience at Studstrup Power Station provided the engineering design basis for DOE's Proposed Action. A Danish consulting engineering services firm, Tech-Wise A/S, and Bradford Conrad Crow Engineering (BCCE) of Tigard, Oregon, have designed a switchgrass storage and processing system based on Tech-Wise's experience with the Studstrup plant. Construction and operation of this system at OGS is part of the Proposed Action assessed in this EA. Alliant Energy, BCCE, Tech-Wise A/S, and others have prepared and submitted to DOE a detailed design package for the proposed new facilities, which is incorporated into this EA by reference (Alliant Energy et al. 2002).

Location. The proposed new facilities would be built on OGS plant property. Figure 3 illustrates the OGS and the proposed location for the new facilities directly west of the plant. Originally, the proposed new facilities were to be located directly east of the OGS plant. This location was the site of the switchgrass handling operations during Phase 1. However, Alliant Energy has determined that in order to maintain future options to expand the OGS plant, it would need to retain the area east of the main plant. Consequently, the proposed site for the new switchgrass facilities has been moved to a location approximately 335 meters (1,100 feet) west of the OGS main plant. Figure 4, an aerial photograph of the OGS taken in 2001, illustrates the location of the proposed new facilities and other OGS site features. Most of the area that the proposed switchgrass operation would occupy is an old parking lot currently used to store power line poles and other equipment. Pole storage would be relocated to another onsite location or to leased offsite land. In this area, only very limited demolition would be required to remove an old pole-mounted transformer. A small office building is located on the proposed site; this building would remain. The existing Phase 1 storage barn and process building shown in Figure 4 would also be used for storage and processing during the Proposed Action.

Footprints. The new storage barn and process building that would be built for the Proposed Action would have footprints of approximately 2,512 square meters (27,035 square feet) and 637 square meters (6,862 square feet), respectively. The two buildings would be connected by a transfer gallery of approximately 189 square meters (2,035 square feet), elevated approximately 7 meters (23 feet) above the ground. Thus, the total footprint of the new construction for the Proposed Action would be approximately 3,338 square meters (35,932 square feet) (Table 1). Full-scale commercial operations (Phase 3) are not part of DOE's Proposed Action. However, if Phase 2 were successful and led to Phase 3, the size of the new storage barn and process building would both be expanded (approximately doubled) to accommodate the increased volume of switchgrass necessary for Phase 3 (Table 1).

Figure 3. OGS Plant Looking Northeast from the Site of the Proposed New Facilities

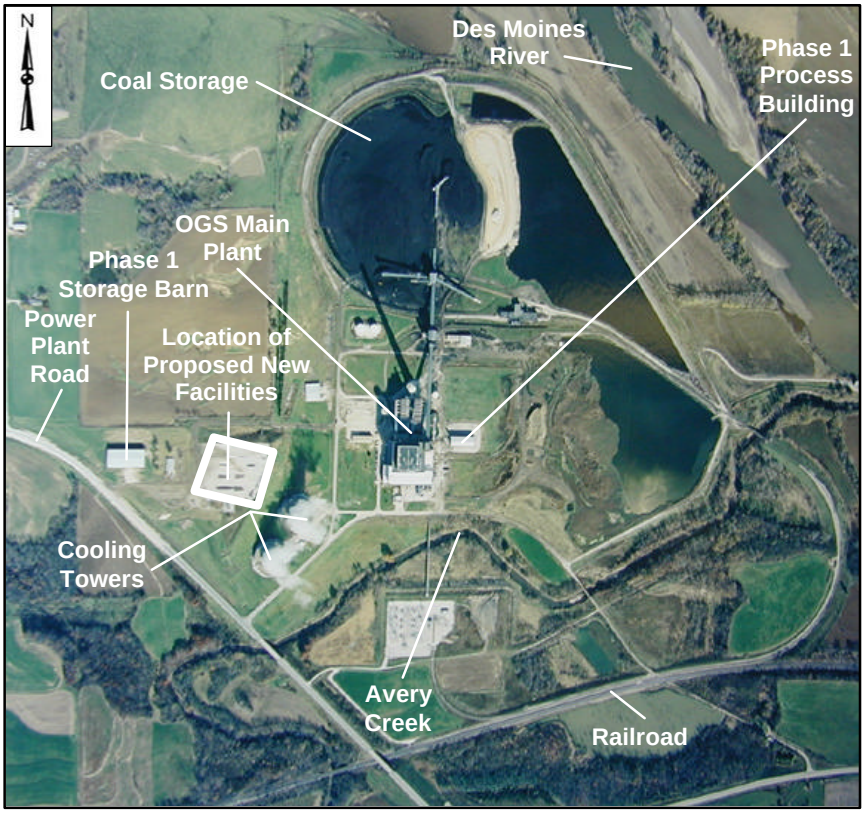


Figure 4. Aerial View of the OGS

Table 1. New Facility Footprints[a]

Facility	Footprint (Square Feet)[b]		
	Phase 2 (Proposed Action)	Phase 3	Total
Storage Barn	27,035	23,950	50,985
Gallery	2,035	0	2,035
Process Building	6,862	6,862	13,724
Total	**35,932**	**30,812**	**66,744**

a. Source: BCCE 2003a.
b. To convert square feet to square meters, multiply by 0.093.

Figure 5 illustrates the approximate configuration and alignment of the new facilities (for Phases 2 and 3) in relation to the OGS main plant site. Figure 6 illustrates the profiles of the new facilities (for Phases 2 and 3) as they would be seen from the ground. Figure 7 illustrates the footprints of the new facilities for the Proposed Action (Phase 2) and for a potential future expansion (Phase 3). Ground elevation differences in the area of the footprints would require up to 1.5 meters (5 feet) of cut and/or fill grade-work.

Utilities. Two transformers would be installed and located to take advantage of an existing buried line and to deliver the required electrical services for the proposed facilities. Existing sanitary and non-potable (non-drinking) water lines would be extended to the proposed process building and would be used for a single toilet, a sink, and eyewash stations. A bottled-water dispenser would be used to supply potable (drinking) water. Four new fire hydrants would be installed outside of the buildings, with two fire department hose connections.

Truck Parking. As illustrated in Figure 5, a new delivery truck parking and staging area would be built. This area would accommodate two groups of switchgrass delivery truck drivers. One group would be those drivers who would not exchange their incoming, full trailer for an outgoing, empty trailer; these drivers would likely be farmers who owned their own trailers and preferred to make deliveries themselves. The second group of drivers would exchange their full trailer for an empty trailer to avoid potential waiting delays at the storage barn; these drivers would likely be contract drivers who would handle deliveries for farmers not wishing to deliver the switchgrass themselves.

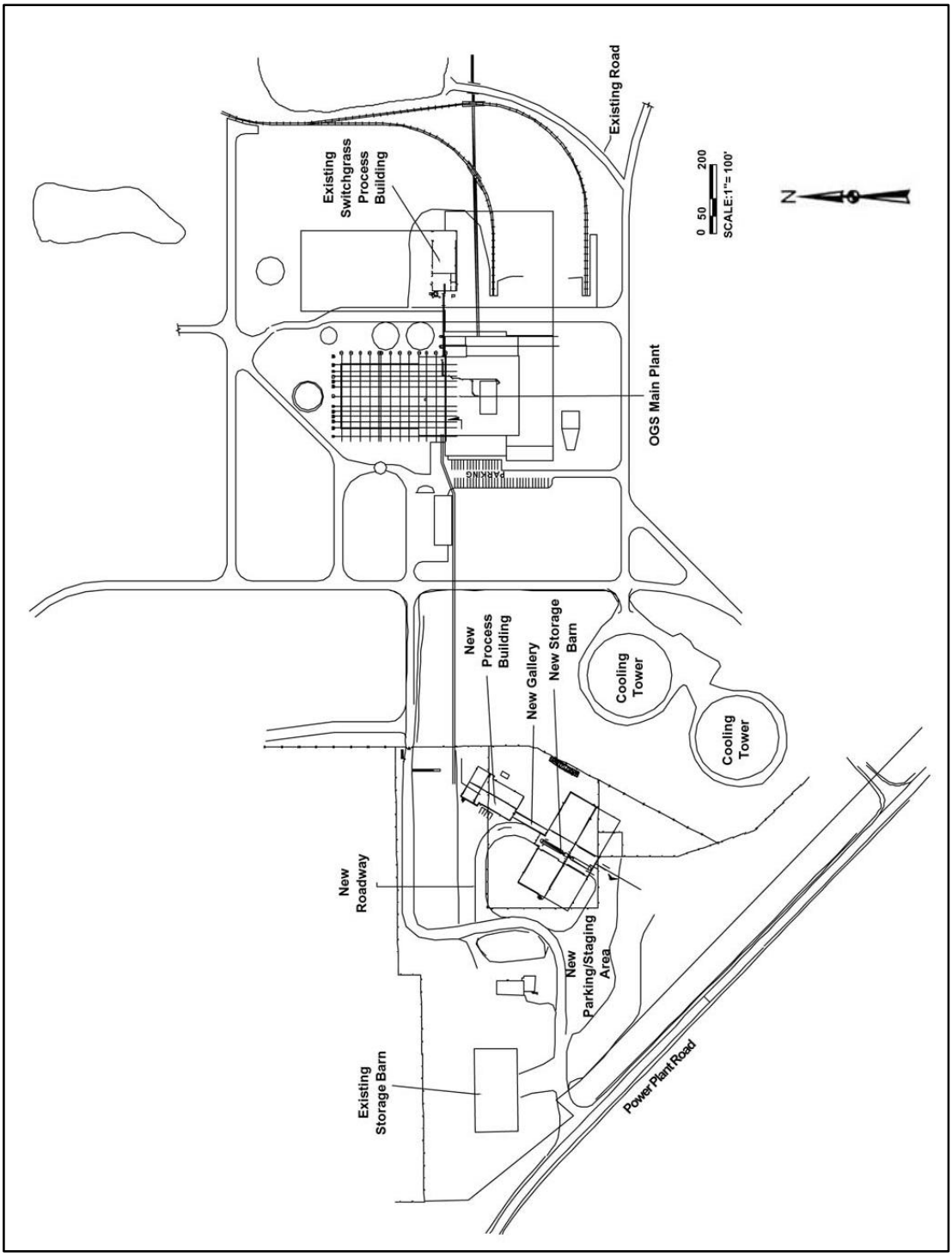
Approximately 1,100 square meters (12,000 square feet) of parking would be developed just west of the proposed storage barn and process building. This area would prevent potential traffic backups at the unloading facility. There would be approximately 150 meters (500 feet) (six-truck capacity) of available space for trucks to queue in front of the storage barn. This area would be used by both groups of drivers. The normal unloading time per truck, including cleanup, would be about 20 minutes. There would be two receiving/unloading bays in the storage barn. Therefore, if there were a line of six trucks at the facility, the last driver in line would have to wait at least 60 minutes.

2.1.2 Operations

This section describes the processes and equipment that would comprise the Proposed Action and potentially a subsequent commercial scenario.

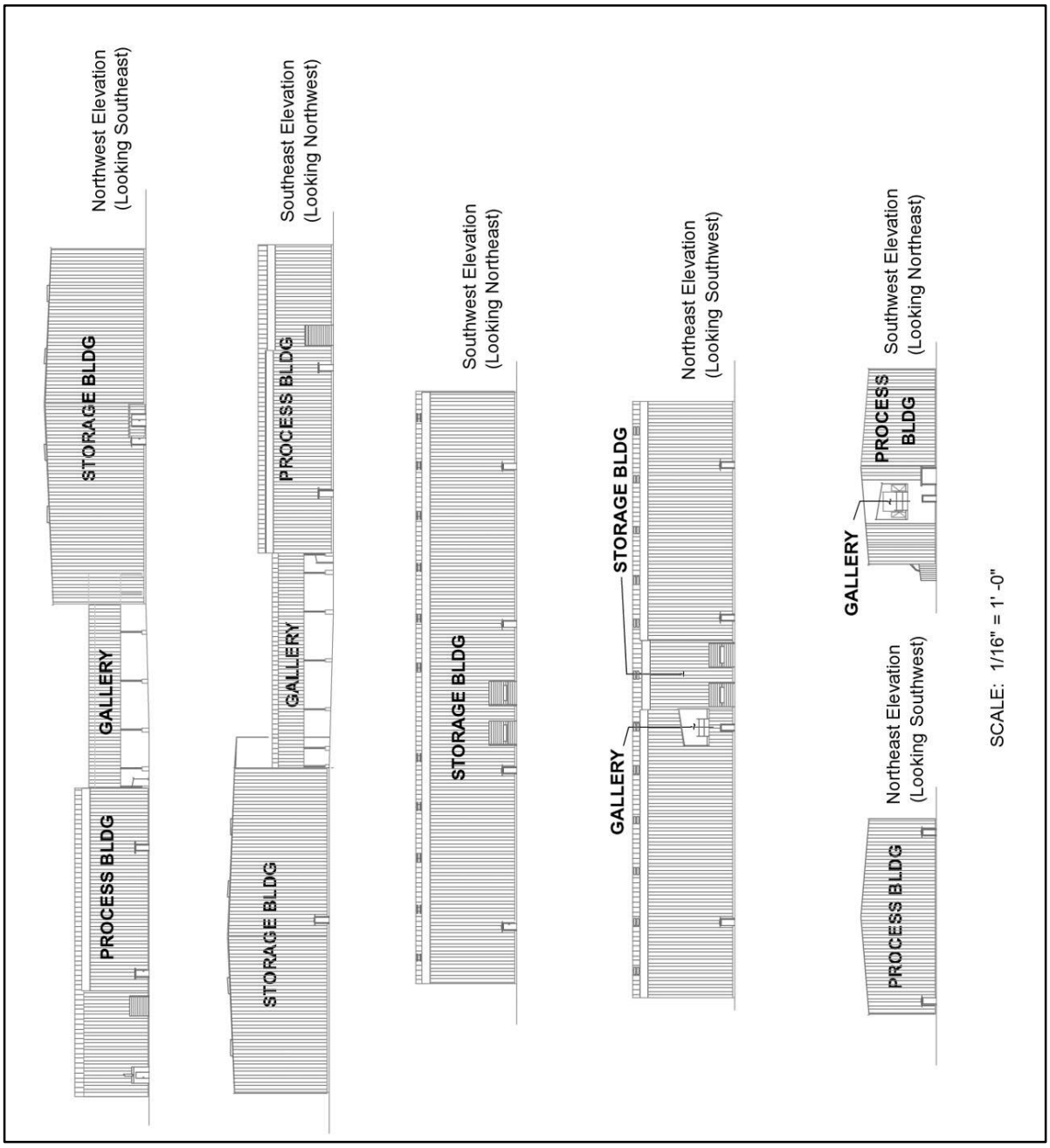
2.1.2.1 Switchgrass Harvest and Storage

When ready, switchgrass would be harvested and baled into large bales approximately 0.9 × 1.2 × 2.4 meters (3 × 4 × 8 feet) and weighing approximately 450 kilograms (0.5 ton, or 1,000 pounds) each. The bales would be loaded onto 16-meter (53-foot) extended flatbed trucks.



Source: BCCE 2003b.

Figure 5. Site Plan



Source: BCCE 2003c.

Figure 6. Profile of New Facilities (Phases 2 and 3)

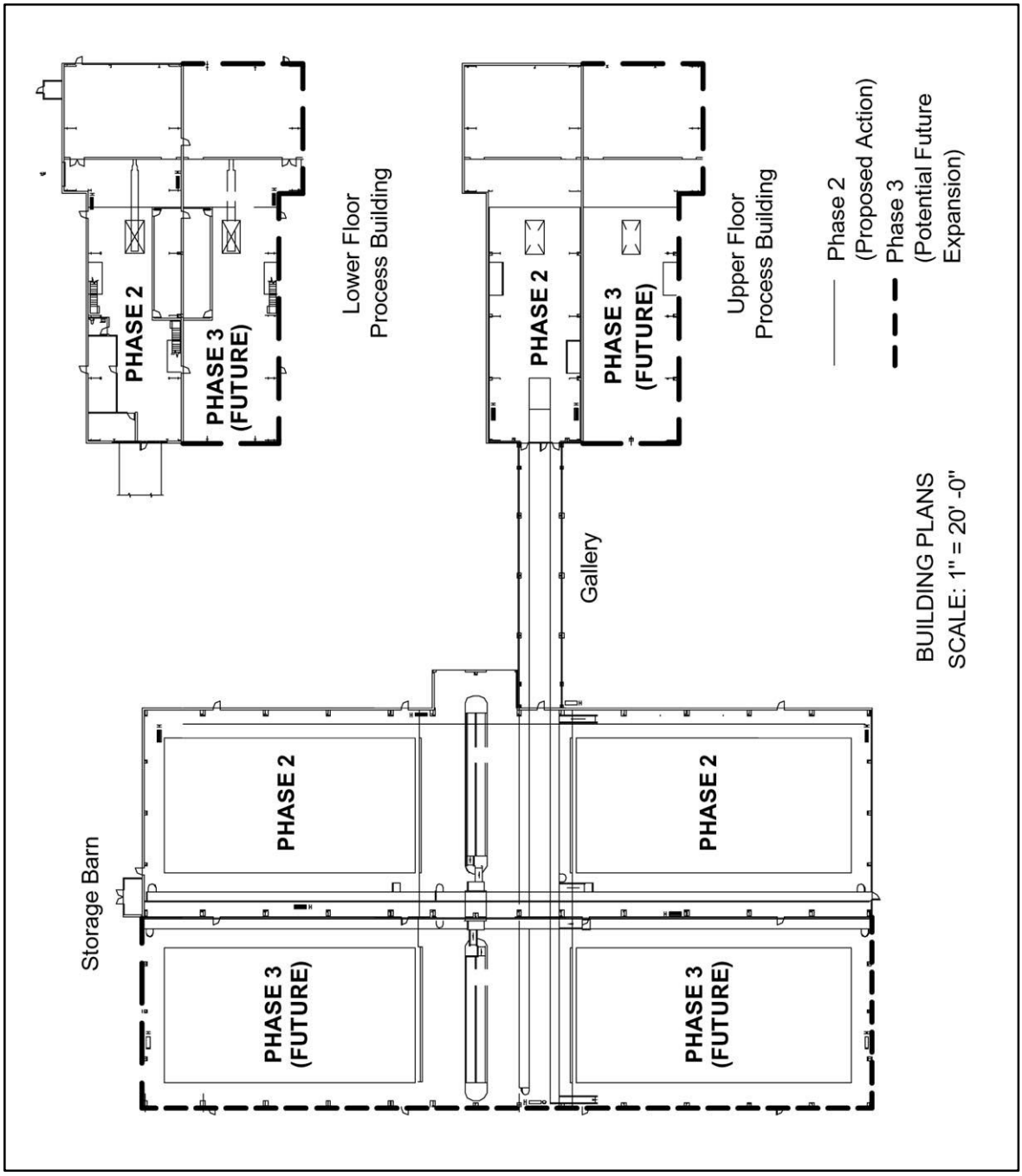


Figure 7. Footprints for Proposed Action and Potential Future Expansion

Typically, each fully loaded truck would carry 42 bales and would weigh approximately 19 tonnes (21 tons). Depending on the supply of switchgrass at OGS and the plant's immediate needs, the bales would be either stored in temporary offsite storage facilities, delivered to the proposed new storage barn, or unloaded directly at the proposed new process building. Because the switchgrass harvest season is approximately 3 months long, and because co-firing operations would occur virtually year-round (except for 1 month per year when the plant is shut down for maintenance), it would be necessary to store significant volumes of switchgrass before it is processed and co-fired. A bale-receiving system that uses an overhead crane would serve three purposes. First, the system would unload bales from the delivery trucks. Second, for bales going into storage, the system would stack the bales in the barn. Third, when needed, the system would recover stacked bales and deliver them to the process building via a conveyer system. Stored bales would be recovered using a first-in/first-out inventory control system. Figure 8 illustrates various aspects of switchgrass harvest and storage operations.

Figure 8. Switchgrass Harvest and Storage Operations (clockwise from upper left: typical switchgrass field, harvesting, storage, fully loaded flat-bed delivery truck)

2.1.2.2 Switchgrass Processing and Co-firing

When ready for processing, the bales would be loaded onto a chain conveyor system that would transport them to one of several processing units in the process building. The baling twine holding the bales together would be automatically removed and recovered. The loose bales would then be conveyed to a debaler. After debaling, the loose switchgrass would be leveled on a belt conveyor. An induced draft fan with a bag house would then vacuum the loose switchgrass through a stone trap to remove the heaviest foreign particles; the switchgrass would then be conveyed to a hammer mill unit. In the hammer mill, the switchgrass would be sieved and beaten into fine particles. The particles would be caught in a hopper below the hammer mill. A screw conveyor would convey the particles to a rotary airlock and pneumatic

transport system that would carry the pulverized switchgrass to the OGS burner. At the burner, the pulverized switchgrass would be injected through nozzles into the burner, where it would be co-fired with pulverized coal.

2.1.3 Decommissioning

Decommissioning would entail the dismantling and disposal of the switchgrass storage barn and process building constructed under the Proposed Action. This would be necessary if switchgrass operations were determined to be economically, technically, or environmentally infeasible. Similarly, decommissioning would be required when the OGS reached the end of its life cycle. If, in the short term, it were decided that the project was not feasible, dismantling and removal of the onsite additions would be negotiated among DOE, Alliant Energy, and the Chariton Valley RC&D. Alliant might request restoration of the property to its original condition. The owner of the existing onsite switchgrass storage barns, Prairie Lands Bio Products, Inc., would retain ownership of the barns and would be responsible for their disposition. DOE would have the option of recovering the equipment and buildings it paid for and installed under the Proposed Action. Alternately, DOE could opt to sell them to Alliant Energy, or to another party, or to contract for their removal and disposal. Regardless of which short-term decommissioning option would be selected, it would not require a shutdown or any disruption of OGS's normal operations or pose significant permitting obstacles.

If switchgrass co-fire operations proved to be economically, technically, and environmentally feasible and were fully integrated into OGS's normal operations by Chariton Valley RC&D and Alliant Energy, decommissioning of the onsite switchgrass storage and process buildings constructed under the Proposed Action at the OGS plant would be integrated into the decommissioning and closure plans for the whole OGS plant at the end of its life cycle.

2.2 No Action Alternative

For NEPA compliance purposes and for the purposes of analyzing a meaningful "no action" scenario, DOE has assumed that Chariton Valley RC&D and Alliant Energy would abandon the plans for Phase 2 and Phase 3 co-fire infrastructure construction and ancillary activities if DOE funding were not forthcoming. Under this scenario, DOE assumes that the existing switchgrass storage and processing facilities would be demolished or converted to other uses. However, DOE recognizes that Chariton Valley RC&D and Alliant Energy, at their discretion, could opt to pursue the project independently or to seek alternate sources of funding if DOE decided not to fund the Proposed Action.

3.0 EXISTING ENVIRONMENT

To assess the potential impacts under the Proposed Action, DOE first determines the condition of the environment as it currently exists. This section characterizes the existing environment; Section 4.0 assesses the potential impacts that could occur under the Proposed Action.

3.1 Air Quality and Meteorology

3.1.1 Air Quality

The National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency (EPA) and subsequently adopted as the Iowa Ambient Air Quality Standards define the allowable concentration of criteria air pollutants that may be reached but not exceeded in a given time period. These standards were established to protect human health (primary standards) and welfare (secondary standards) with a reasonable margin of safety. The criteria pollutant standards establish maximum concentrations for ozone, carbon monoxide, nitrogen oxides, sulfur dioxide, lead, and particulate matter with a diameter of 10 microns or less (PM_{10}). Ozone is formed by the photo-oxidation of reactive